Configurations of the Interactive Use of Environmental Management Control

Angèle Renaud

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Les configurations de contrôle interactif dans le domaine environnemental

Angèle RENAUD*

Abstract

This paper explores the use of interactive environmental management control. In order to do this, a theoretical model is designed drawing on the framework of Simons (1995) and instrumental stakeholder theory. This model defines three dimensions of interactive control: forms of interactivity (vertical, horizontal, external), frequencies of interactivity (high, medium, low) and decision levels (strategic, tactical, operational). Four typical configurations emerge from application of the model to empirical data from ten case studies: eco-designers, eco-institutionals, eco-managers and eco-educators. These configurations show the diverse roles of interactive environmental management control in firms: strategic, political, tactical and educational. These results provide lessons for future research.

KEYWORDS: ENVIRONMENTAL MANAGEMENT CONTROL (EMC) – INTERACTIVE CONTROL – STAKEHOLDERS – CONFIGURATIONS – GREEN INNOVATIONS

Résumé

Cet article étudie l'usage du contrôle interactif dans le domaine environnemental. Pour ce faire, un modèle d'analyse est conçu en mobilisant les travaux de Simons (1995) et la théorie instrumentale des parties prenantes. Ce modèle théorique définit les trois dimensions du contrôle interactif : les formes d'interactivité (verticale, horizontale, externe), les fréquences d'interactivité (forte, moyenne, faible) et les niveaux de décision (stratégique, tactique, opérationnel). Quatre configurations-types émergent de la confrontation du modèle aux données empiriques issues de dix études de cas : éco-concepteurs, éco-institutionnels, éco-gestionnaires et éco-éducateurs. Ces configurations montrent les divers rôles du contrôle de gestion environnemental interactif dans les entreprises : stratégique, politique, tactique et pédagogique. Ces résultats permettent de tirer des enseignements pour les recherches futures.

MOTS CLÉS : CONTRÔLE DE GESTION ENVIRONNEMENTAL (CGE) – CONTROLE INTERACTIF – PARTIES PRENANTES – CONFIGURATIONS – INNOVATIONS VERTES

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Introduction

Thinking on the relationships between management control and strategy has evolved since the pioneering work of Anthony (1965, 1988). Although historically, management control was the preferred tool for implementing an organization's strategies, Simons (1990, 1991, 1994, 1995, 2000) showed that its role also includes helping strategies emerge. By introducing the concept of "*interactive control"*, Simons opened up new research perspectives in the field of management control, which had so far been part of an approach known as "*diagnostic"*, describing "*management control systems as being management tools that are exceptionally used to set up the strategies desired by the managers"* (Simons 1991, p. 49). In the interactive approach, management control relates to "*formal information systems that managers use to be personally and regularly involved in the decisions of their subordinates*" (Simons 1995, p. 95). Unlike diagnostic control, which is concerned with the smooth running of the organizational routine, interactive control can stimulate innovation and the search for new strategic opportunities.

Simons[i]' conceptual framework is widely used in the literature today. Dambrin and Lonïng (2008) emphasize how often this author has been quoted: "*156 references were made to his work in the 69 articles collected from Science Direct and EBSCO"*. Several studies have shown the interactive use of management control systems, such as budgets (Abernethy and Brownell 1999, Van Der Stede 2001, Sponem and Lambert 2010) dashboards (Vaivio 2004, Tuomela 2005, Henri 2006, Naro and Travaillé 2010) and project management control systems (Davila 2000, Gautier 2002, Bisbe and Otley 2004). Despite this empirical literature, the concept of interactive control remains unclear. Some authors (Benavent and de La Villarmois 2000, Marginson 2002, Bisbe *et al*. 2007, Berland and Persiaux 2008, Bouquin 2009, and others) point out the limits of its operationalization. In their view, Simons was not specific enough about how interactive control is used in companies. The practicalities of this concept deserve further investigation.

This is the context to my research, which aims to examine how interactive control works in the environmental field. This aim is expressed here by the concept of "interactive environmental management control". The term environmental management control (EMC) is used to mean the extension of management control to environmental concerns, in order to implement or modify

the organization's green strategies. Very few authors (see Marquet-Pondeville 2003, Renaud 2009, Essid and Berland 2011, Gond and Igalens 2012) have shown any interest in this question, and yet the environmental field would appear to be a good candidate for interactive control, given the strategic uncertainties characterizing it (increasingly stringent environmental regulations, difficulty in forecasting green market trends, environmental risks) and the many debates and confrontations of ideas it inspires between businesses and their internal and external stakeholders. Moreover, analysis of interactive control in an emerging field may be a source of learning for a better grasp of this concept.

In this article, I therefore attempt to answer the following research question: how is interactive control used in the environmental field? To answer this, I adopted a qualitative, abductive approach (David 2000, Gavard-Perret *et al*. 2008). The conceptual framework for the research was constructed by a cross-combination of the literature on interactive control and instrumental (or managerial) stakeholder theory. Ten case studies were conducted with environmentally proactive companies of different sectors and sizes. Based on the results, four typical configurations of EMC are proposed (eco-designers, eco-institutionals, eco-managers and eco-educators) according to three analysis criteria (forms of interactivity, frequencies of interactivity and decision levels).

This article comprises three parts: the first part presents a conceptual research framework; the second part explains and describes the methodology applied; and the third part shows and analyzes the results obtained, and concludes with a discussion of contributions, limitations, and future avenues for research.

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1. Conceptual Research Framework: the question of Interactive Control in the Environmental Field

This part presents the theoretical aspects of this research. Based on a review of the literature, the conceptual framework is constructed by combining research on interactive control and research on stakeholder involvement. It explains the concept of interactive control by showcasing its three dimensions (1.1) and its specific features in the environmental field (1.2), and proposes an interactive EMC analysis model (1.3).

1.1. Interactive Control: an Innovative Concept Whose Contours Remain Vague

According to Simons, interactive control can focus managers' attention on "*strategic uncertainties"* (threats or strategic opportunities) and foster innovation and the emergence of new strategies by establishing regular debates within the organization. This concept is hailed as innovative in the literature, since it casts a "*subtle and enriching"* light on the links between control and strategy (Bouquin 2009). However, it remains complex and is far from fully explored (Benavent and de La Villarmois 2000, Bisbe *et al.* 2007, Bouquin 2009). Little is known about how interactive control systems are used in organizations (Marginson 2002, Berland and Persiaux 2008). In this study, three dimensions will be highlighted to define the scope of the concept: forms of interactivity, frequencies of interactivity and decision levels. As we will see later, these dimensions take on their full meaning in the environmental field.

According to the literature (Tani 1995, Gautier 2002, Berland and Persiaux 2008), interactive control is characterized by forms of interactivity: vertical (*i.e.,* intensive, regular discussions between top management, middle managers and their subordinates) or horizontal (*i.e.* through comparing knowledge between managers who belong to different functions within the organization, but are involved in a common project). However, it should be noted that these two forms of interactivity only focus on the involvement of "internal stakeholders" (as defined by Nasï and Carroll 1997)[ii]. In practice, more and more "external stakeholders" want to be involved in corporate decision-making processes, especially in corporate social responsibility (CSR) matters. Incorporating external stakeholder involvement into the interactive process suggests the existence (demonstrated in this article) of a third form of interactivity that I call the concept of "external interactivity" (discussed further below).

In addition to forms of interactivity, other aspects of interactive control remain to be clarified. Although debate and dialogue are distinctive elements of interactive control (Simons 2000), the

frequency of discussions is not specified. In the companies studied by the author, the information produced by interactive control systems is discussed at variable frequencies, during weekly, twice-monthly, monthly or quarterly meetings (see Simons 1991, p. 53-55, 1995, p. 96-100). Does this mean that a lower frequency (e.g.: half-yearly or annually) cannot be classified as interactive? What is the frequency of discussions in an interactive control system, bearing in mind that diagnostic control does not exclude discussion?

Again according to Simons, interactive control fosters innovations and leads managers to make strategic decisions. Are they radical innovations (as per Porter and Stern 2001) "*allowing firms to overcome the barriers imposed by competitors and to maintain or create competitive advantages on constantly changing markets"* (Aktouf *et al*. 2006, p. 462)? Simons does not specify the nature of these innovations, which can range from incremental (minor and relative) innovations "*consisting of gradual improvement of the features of a product, procedure, service or process"* to radical innovations (major innovations and breakthroughs) *"whose development and implementation of techno-scientific knowledge and new know-how aim to revolutionize performance of the corporate offer"* (ibid.). In short, the question is whether the interactive process produces incremental and/or radical innovations.

In this article, radical innovations are considered as major strategic issues for companies, whereas minor innovations relate to tactical and operational manoeuvres. In the rest of this article, I use the term strategic and tactical decisions to refer to decisions by top managers and middle managers relating respectively to radical and incremental innovations. Operational decisions, whose purpose is to translate previous decisions into concrete daily actions, concern non-managers.

1.2. Is Interactive Control in the Environmental Field a Process Open to Stakeholders?

Like Simons, I define environmental management control (EMC) as all the formal processes and procedures based on the information that managers use to implement or modify the organization's green strategies. This type of control is intended for managers and makes use of formal, specific devices in the environmental field that are sometimes called "*eco-tools"* (Lafontaine 1998) or "*eco-control tools"* (Henri and Journeault 2010). It involves either adapting traditional management control tools (*i.e.*, performance indicators, budgets, action plans, etc.) to environmental performance management (Caron *et al.* 2007, Janicot 2007), or using new tools such as life cycle analyses (LCA) or environmental audits. LCAs or eco-reports

measure the environmental impacts of products (good, services or procedures) throughout their existence (Christophe 2009), whereas environmental audits, further downstream than LCAs, evaluate the environmental performances of a company (Jolliet *et al*. 2010).

Although the interactive use of EMC has not been extensively studied in the literature, the few existing studies show the presence of interactive control in the fields of CSR (Moquet 2008, Essid and Berland 2011, Gond and Igalens 2012), especially with regard to the environment (Marquet-Pondeville 2003, Renaud 2009). The question of the existence of interactive EMC arises because the environmental field seems to be conducive to interactive control, due to its inherent strategic uncertainties and the many interactions it generates between the company and its various stakeholders. These two reasons lead me to explore further how interactive control operates in the environmental field.

The natural environment is an unstable domain and "*a source of strategic uncertainty for companies, because [it] redefines markets and practices"* (Essid and Berland 2011). Generally, three types of uncertainty are identified (Marquet-Pondeville 2003, Martinet and Reynaud 2004): legislative uncertainty (related to changes in legislation and regulations on environmental protection), green market uncertainty (related to the difficulty of predicting consumer behaviour regarding green products and changes in competitors' green strategy) and environmental risks (which are still poorly controlled). According to Lafontaine (1998), these uncertainties cannot be ignored by businesses, especially those operating in an unstable ecological environment, since their survival depends on it. According to Simons, the interactive use of EMC would enable managers to cope with these strategic uncertainties.

The environmental field is also characterized by "*taking [external] stakeholders into consideration in corporate governance"* (Mercier 2006). In the instrumental view of stakeholder theory (Freeman 1984), incorporating external stakeholders' demands into managerial decisions is a requirement for improving the economic and financial performance of companies (Capron and Quairel 2007). A number of studies using this theory (Andriof and Waddock 2002, Bonnafous-Boucher and Pesqueux 2006, Greenwood 2007, Sobczak and Berthoin Antal 2010) show that directors have less and less freedom to decide without seeking input from external stakeholders. "*These players, who include the media, public authorities, non-governmental organizations, consumers and residents' associations, are no longer content with just evaluating the performance of companies in these different fields [economic, social and environmental] and holding them accountable for their past actions. They are now seeking*

to influence the decision-making process itself in companies whenever future objectives are being set, so that their interests will be taken into consideration upstream" (Sobczak and Berthoin Antal 2010, p. 118).

Combining work on interactive control and the stakeholder involvement, I propose to consider interactive control in the environmental field as a process of dialogue and discussion open to internal and external stakeholders with an interest in corporate environmental performance. Thus, interactivity is no longer restricted to its internal forms (vertical and horizontal), since a third form emerges in this area. This new form of interactivity, which I call "external interactivity", refers to the permanent process of dialogue and consultation through which decision-makers and external stakeholders can discuss or work together to try and resolve the company's environmental (or even societal) issues.

1.3. Proposal for an Interactive Environmental Management Control Analysis Model

Based on the above discussion, the concept of interactive EMC will be operationalized along three dimensions: forms of interactivity, frequencies of interactivity and decision levels (Table 1). In this table, the decision levels are classified by green innovation type (radical or incremental). "*A green innovation can be defined as a solution or set of alternative solutions that makes it possible (more effectively than existing solutions) to measure, monitor, limit, correct, and possibly prevent damage to the environment and climate, or, more broadly, to respect the sustainable development objectives"* (Depret and Hamdouch 2009, p. 130).

Table 1: The Three Dimensions of Interactive Environmental Management Control

Forms of Interactivity	**Vertical Interactivity**: Discussions between top managers, middle managers and subordinates at all levels of responsibility in the company	**Horizontal (or Transversal) Interactivity**: Discussions between managers at the same hierarchical level, but belonging to different functions or structures in the company and working on a common project	**External Interactivity**: Discussions between top managers or middle managers and external stakeholders
Frequencies of Interactivity	**High**: Daily, weekly, monthly	**Medium**: Every two months, quarterly, half-yearly	**Low**: Annually, less than once a year

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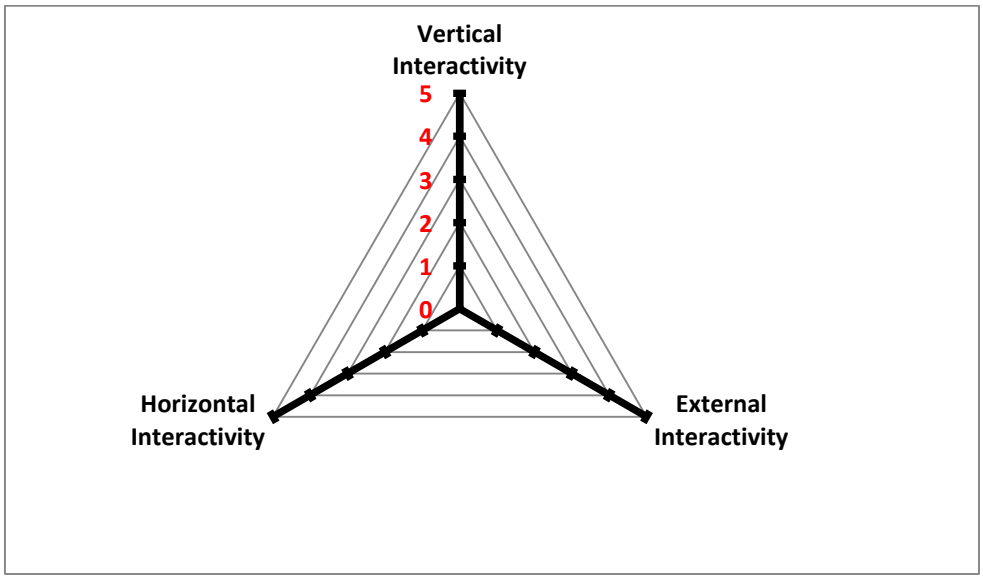
Decision levels induced by the interactivity	**Strategic Decisions**: Radical green innovations are strategic projects: integrated, clean or preventive technologies that help prevent or reduce production of pollutants and/or consumption of inputs (materials, natural resources, energy, etc.) in the production process. **Examples**: Phosphate-free eco-products or low-energy products, solvent-free paint, chlorine-free chemicals, biofuel, renewable energies, low or zero-carbon technologies	**Tactical Decisions**: Incremental green innovations are more tactical than strategic. They cover "end-of-line" procedures, additives or curatives that mitigate the environmental impact of the manufacturing processes. They consist of gradual, *ex-pos*t modifications to production methods that affect the environment. **Examples**: Pollution control technologies, waste management and recycling, clean-up technologies, environmental improvement of packaging materials	**Operational Decisions**: These decisions put incremental and radical green innovations into practical application in ordinary activities and routine tasks. **Examples**: Replacing incandescent light bulbs with low-energy bulbs, using videoconferencing to limit travel, sorting waste

The combination of the three dimensions presented in the table above leads to a proposed interactive EMC analysis model. This model is the first theoretical contribution of this research. It can be schematically represented in a "radar" chart (Figure 1). The axes correspond to the three forms of interactivity: each one is graduated according to frequency (high, medium or low) and the resulting type of decision (strategic, tactical and/or operational). The frequency of interactivity is assigned a score from 1 (low) to 5 (high). Decision-making is assigned the value of 1 for operational decisions, 3 for tactical decisions and 5 for strategic decisions. As we will see later, when completed with empirical data, this radar chart will bring out two triangles representing the frequencies of interactivity and decision levels.

Figure 1: Theoretical Analysis Model for Interactive Environmental Management Control



The model theoretically allows for a variety of possibilities: 84 models[iii] can be produced by combining these three dimensions! This raises the question of whether any typical interactive EMC configurations actually exist. According to Bouquin (2009, p. 617), these configurations can be defined based on managers' strategies: *"They should form the basis for a limited number of typical control models, out of the many combinations that the large number of components used can theoretically generate"*. Using empirical data, we will bring out of typical models, or ideal types of interactive EMC.

2. Research Methodology: Multi-site case study

The methodological part of the research first explains the choice of a multi-site case study as the research strategy, and the selection criteria for the cases (2.1), then describes the data collection and analysis methods (2.2).

2.1. Justification for the Multi-Site Case Study and Case Selection

I decided to use a qualitative methodology based on a multi-site case study, following the observations of Bouquin (2004, 2009) who argues that "*to attempt to understand the complexity of the relationships between control and strategy, we need to abandon a methodology based on testing binary relationships and opt for a qualitative process (…) favouring case studies and the search for global consistencies and profiles"*. Since the objective here is to propose control

configurations by studying the EMC process in various organizational contexts, the multi-site case study approach appears appropriate to this research.

I carried out ten case studies[iv], which were selected according to criteria commonly used in the literature (see Hlady Rispal 2002, p. 83–86). To respect the theoretical representativeness criterion, i.e., "*homogeneity of the cases in terms of the question to be studied"*, two selection criteria were chosen: the proactive nature of the green strategy[v], and the existence of a formalized EMC. Proactive companies were selected since according to the literature (see Henriques and Sadorsky 1999, Cumming 2001, Andriof and Waddock 2002, Pedersen 2006, Gendron and André de la Porte 2009), such companies have the distinction of involving a large number of internal and external stakeholders in their decision-making processes, unlike less advanced companies which simply publish environmental information in reports without it affecting their decision-making. Moreover, the companies selected were ISO 14001 certified, which is in theory a guarantee that they have introduced formalized environmental management and use formal EMC mechanisms. This control formalization is crucial in this research, since the concept of interactive control only applies to formal information systems used by management. Simons (1994, p. 170) explicitly excludes informal control from his analyses.

The variety criterion, which "*increases understanding of the phenomenon under study and its complexity"* was also respected, since the companies selected are of different sizes and belong to seven business sectors with specific environmental problems: aeronautics, trade and distribution, chemicals, industrial gases, plastics, eco-industry, and agro-food (Appendix 1). Since there are higher numbers of chemicals and gas companies, this selection does not provide "*a balanced variety of different situations"*. However, this does not undermine the quality of the research, since as specified by Hlady Rispal (2002), this criterion is not essential if the research objective is to arrive at a theory. The "*potential of discovery*" criterion, however, is a determining factor in this research. This is conveyed by the "*wealth of data available and the potential for collecting and analyzing data."*

2.2. Data Collection and Analysis

The case studies are based on triangulated data collection. Three collection techniques were used to triangulate our data: semi-structured interviews, observation and written data collection. I collected approximately ten documents per case (environmental and sustainable development reports, meeting minutes, press articles, web pages, etc.), took notes during visits to the

companies and conducted 31 interviews with three categories of players: senior executives or top managers (president, general manager, regional manager), environmental managers (environmental manager, sustainable development manager, etc.) and middle managers (plant manager, store manager, airport manager, etc.). Interviews lasted an average 1.5 hours. Using the interview guide devised by Simons (1991, p. 51–52) as a basis, the main topics covered during the interview were green strategy, the role of stakeholders in environmental management, the control systems used to make decisions, the frequency of meetings held to discuss environmental data, concrete examples of improved environmental performance, etc.

No management controller was interviewed, since the literature (Quairel 2004, 2006, Berland 2007, Rivière-Giordano 2007, etc.) emphasizes the limited (possibly even non-existent) role of management controllers in CSR fields. This observation was confirmed by the interviewees. The absence of controllers in the environmental field does not preclude the existence of EMC. Bouquin (2004, p. 95) rightly asserts that "*we should not confuse the managerial process known as management control with what the management controller does on a daily basis"*. It is also important to remember that according to the definition of management control, "*the main player in management control is clearly the manager, not the management controller. Such is the specificity of this area"* (Lambert and Sponem 2009, p. 113). In the cases studied, EMC is first and foremost a matter for top and middle managers: they are the people who set the environmental objectives, see to their attainment and make corrective decisions. The architects and leaders of this process are environmental managers or specialists rather than management controllers, who continue to focus on the accounting and financial aspects of performance.

After collecting the data, I conducted a thematic content analysis (Hlady Rispal 2002, Miles and Huberman 2004, Bardin 2007). Briefly, this analysis consists of two phases: decontextualization and recontextulization of the corpus. The decontextualization phase involved reading the corpus (interviews and documents), segment by segment, to identify significant ideas (themes) and categorize them by code. To facilitate the codification process, I used the qualitative analysis software NVivo7, since it can handle a large volume of heterogeneous data in an iterative process for a dynamic study of the complexity of a corpus (Fallery and Rodhain 2007), and enables the researcher to locate passages of coded text immediately, and make annotations and comments throughout the analysis (Trebucq 2005). During the recontextualization phase, the previously decontextualized codes were amalgamated into an intelligible, meaningful whole (Deschenaux 2007) with regard to the research objective.

In concrete terms, the data were condensed into "*matrices'*"[vi] (Miles and Huberman 2004), and then interpreted in two steps: one analysis per case was carried out to identify the profile of each company in relation to the theoretical model (presented above), and a subsequent comparative analysis was used to group together cases with the same profile and thus generate typical configurations.

3. Research Results: Emergence of Four Typical Configurations for Interactive Environmental Management Control

The ten case studies resulted in four ideal types of interactive EMCs: eco-designers (3.1), eco-institutionals (3.2), eco-managers (3.3) and eco-educators (3.4). In this part of the article, each configuration is described and illustrated by a radar chart. The radar charts have three axes corresponding to the forms of interactivity (vertical, horizontal and external), and show two triangles representing frequencies of interactivity (Triangle 1) and decision levels (Triangle 2). To facilitate understanding of the analysis, the triangle numbers are indicated in the text[vii], and statements are supported with extracts from the transcripts[viii] made during the research. The configurations are summarized at the end of this section (3.5).

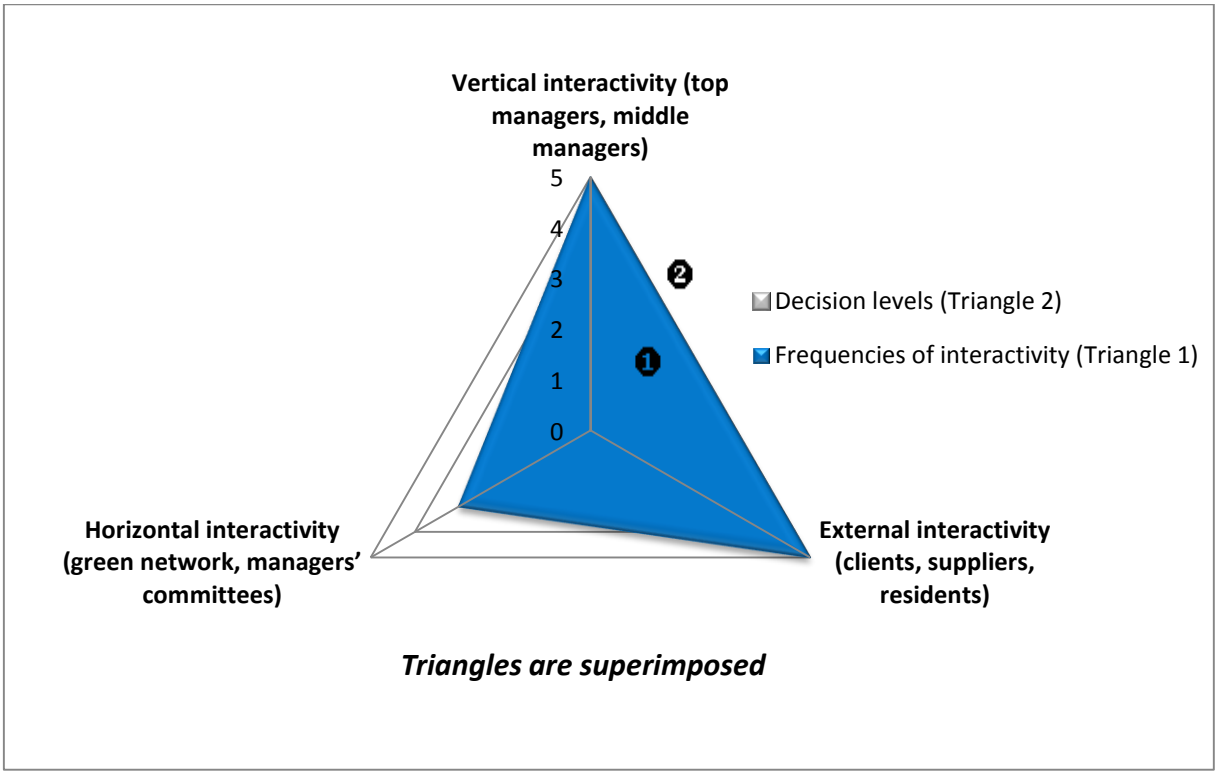
3.1. Eco-Designers, or Using Interactive Environmental Management Control from a Strategic Perspective

Companies C, D, E, F and G make up the ideal type of eco-designers. In these companies, the management uses EMC interactively to encourage green innovations and define eco-design programs that improve the performance of products (goods, services or procedures). These innovations are the central concern, since these managers see them as strategic opportunities that should be seized to gain a competitive advantage, open up new trading channels, or become leaders in their sector of activity.

For example, in chemicals *companies C and D,* managers focus their attention on possible innovations in "green chemicals". In the gas sector, *companies E and F* are developing solutions for "cleaner" industrial gases like hydrogen, which, when used as a fuel combined with fuel cells, can reduce CO_2 emissions by 20% to 30% compared to diesel. The plastics company *G* innovates by offering environmentally friendly tires (tires with low rolling resistance that consume less fuel and generate little pollution).

Although these innovations vary from company to company, the EMC process fostering their emergence follows the same pattern in the different cases (forms of interactivity, frequencies of interactivity, decision levels). This process is illustrated graphically (see Figure 2) and supported below by statements made by the interviewees. To keep the presentation streamlined, quotations come only from the transcripts concerning *companies D, E and G*, each of which represents a different sector of activity.

Figure 2: Interactive Environmental Management Control as applied by Eco-Designers



Analysis of the Forms and Frequencies of Interactivity

The EMC process as used by eco-designers requires regular attention from top management and middle managers. However, the frequency of discussions varies depending on the form of interactivity (see Triangle 1 in Figure 2). It is high on the vertical axes (between top management, middle managers and their subordinates) and external axes (with external stakeholders), but medium on the horizontal axis (between environmental managers, between middle managers).

Vertical interactivity appears at different levels within the organization. Environmental data are initially monitored personally by top management (president-CEO, general manager, regional

managers) and are discussed during the monthly meetings held by strategic committees (executive committee, management committee, regional committee). Next, at middle management level, environmental data are monitored daily, weekly and/or monthly depending on the company.

Monthly and/or quarterly steering meetings are organized locally, on production sites for example. There is also the traditional management review that is part of ISO 14001 certification requirements, which is held once or twice a year. Given the diversity of the discussions and their frequency, vertical interactivity can be considered high.

> *"Every day, I have a summary of the ten or so environmental indicators that tell me whether things are working well or not, this is the daily dashboard showing water waste, water [and] energy consumption, waste, VOCs [volatile organic compounds], etc. (...) Every month, I get together with my engineer for an hour to look at [our] results, alerts, weak points. And we review [our] progress plans every three months. Also, once a year we hold the management review of the environmental system with my entire management team, the environmental engineer who leads the meeting and eight environmental correspondents [from the plant departments and workshops]."* (Plant Manager, Company G)

Horizontal interactivity complements vertical interactivity, but with comparatively medium frequency. This second form of interactivity only appears quarterly or half-yearly in formal discussions between the environmental managers from the company's various sites, who form a committee called the "*green network", "environmental network"* or "*technicians' meeting"*. This network organizes meetings to collectively address problems, discuss changes in the legislation, share good practices on all sites, and reflect on new initiatives that can improve environmental performances.

> *"[The] Group's Environment and Prevention division oversees all the networks, in all countries and plants, and organizes two-and-a-half-day meetings (…). Twice a year, my environment and prevention manager attends these meetings with his entire continent-wide network. Personally, as Site Manager, I don't go (and the same applies for all site managers)."* (Plant Manager, Company G)

At *company G*, in addition to the green network, environmental data are also studied during the meeting held every two years known as the "*Management panel"*, which is essentially made up of operating and functional managers.

> *"We have regular meetings about our sites' industrial performance, the site managers attend those meetings and the environmental aspect is discussed then. Reducing their [environmental impact] is part of the managers' duties (…). We have around sixty plants world-wide, so physical meetings for all managers are organized every two years."* (Risk Manager, Company G)

There is a third form of interactivity involving external stakeholders in the EMC process. For eco-designers, the external stakeholders with the greatest involvement in this process, or at any rate the most frequently mentioned[ix], are clients, suppliers and local residents. Managers seek to innovate by fostering dialogue and establishing partnerships with their clients as part of their eco-design programs. *Company D*, for example, works in partnership with its automobile clients to develop fuel cell technologies for running electric cars. However, this type of association is first and foremost based on creating spaces for discussion.

> "*Discussion forums were set up with certain clients, especially plastics processors, in order to jointly evaluate opportunities for future innovations."* (Sustainable Development Report, Company D)

By including clients in the search for green innovations, managers are aiming to meet their demands exactly, with a view to obtaining a real competitive edge. For example, launching the green tire enabled *Company G* to meet market demand (buying "*the most economic tire to use"*) while setting itself apart from its competitors.

> *"With its high energy efficiency, the [green] tire saves on fuel, helps significantly reduce harmful emissions for the environment, gives our clients a financial advantage, and, with the competitive edge it gives us, contributes to the economic health and longevity of the company"* (CEO, Sustainable Development Report, Company G)

External interactivity also appears in relationships with suppliers and subcontractors. In the case of eco-designers, it is first and foremost through dialogue that companies try to raise their business partners' awareness of environmental issues. Environmental performance then becomes a selection criterion; environmental constraints are included in contracts with their partners, and audits are carried out to check compliance.

> *"For raw material purchases, a maturity table has been set up and applied to our largest suppliers, with a review and discussions during some 30 meetings. Detailed audits are carried out by our teams (30 to 40 annually)"* (Sustainable Development Report, Company G)

Lastly, companies set up several discussion mechanisms to encourage people living near their facilities to become involved in the EMC process. For example, *company E* organizes open

days, dialogue sessions and meetings with local community representatives, a 24-7 telephone line, regular crisis simulation exercises, etc. and publishes information on risks and behaviours in the event of an emergency. There are two main reasons for involving residents: respecting the law on information and protection of local communities living close to SEVESO[x]-classified sites, and protecting the image and reinforcing the social legitimacy of these companies.

> *"Our businesses are still high risk: an incident [can]lead to a problem in terms of the environment or relations with residents, and that would tarnish the corporate image"* (HSE-MR Manager, Company E)

> *"In the past we've already established contact with the local council and residents, giving them a presentation of the site. On the seven sites in the region, two sites had to be declared to the authorities and all the others are SEVESO-classified (...). We have to comply with very stringent risk control regulations, and they're completely integrated with the concept of the environment."* (QE-MR Manager, Company E)

Interpretation of Decision Levels

The eco-designers' interactive use of the EMC process leads to strategic and tactical decisions (see Triangle 2 in Figure 2). Strategically, this interactive process brings companies to innovate regularly. These green innovations seem to be of a radical nature, since they result in major changes to manufacturing procedures and usage modes. For example, at *company G*, strategic planning and discussions focused on the "rolling resistance coefficient" energy performance indicator, and fostered the emergence of major innovations such as green tires. This is a technological breakthrough, since it substantially modifies the product (tires) and also the way it is used by clients (lower fuel consumption).

> *"The [green] tire launched by the Group has broken a technological barrier: increasing energy efficiency without reducing adhesion or duration. (...) Our research teams believe they can bring our tires' rolling resistance coefficient down further, by approximately 25% in the next ten years. All other things being equal, this would cut consumption by nearly 4%."* (Sustainable Development Report, Company G)

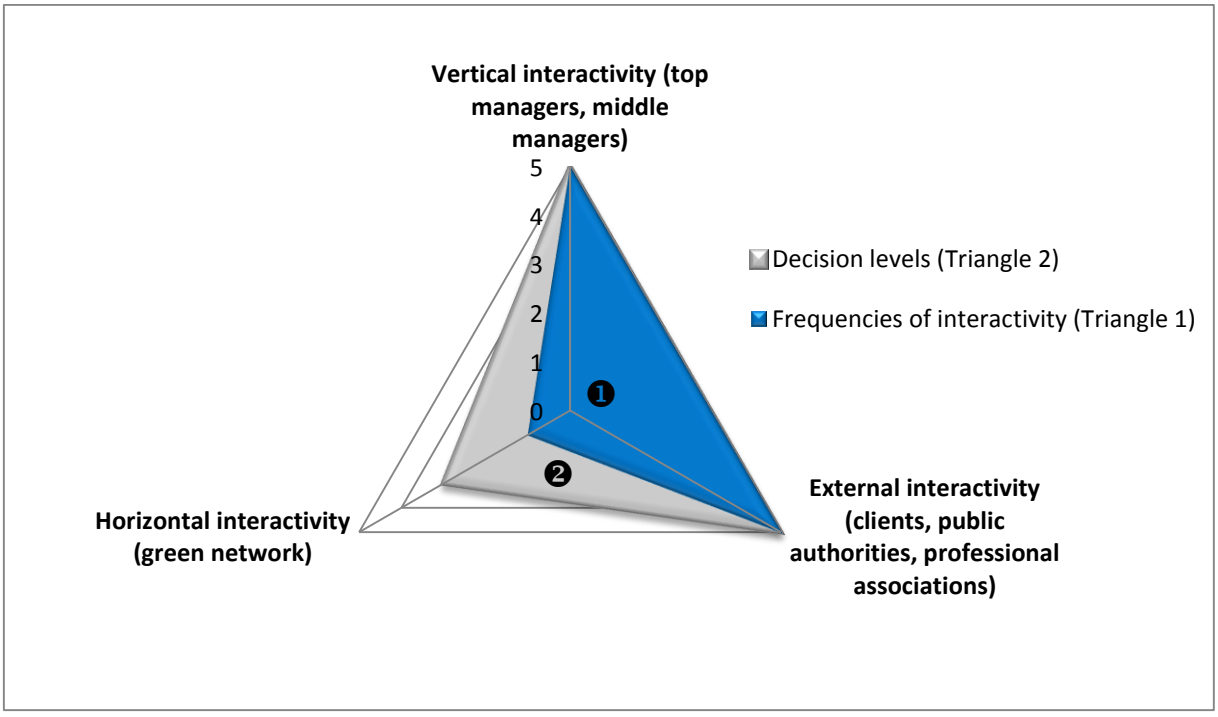
This interactive process also leads to tactical decisions, i.e., minor innovations resulting in subsequent incremental reductions in the environmental impacts generated by the production process. Examples include end-of-line procedures or technologies implemented on production sites to improve waste management and recycling, reducing air emissions, lower natural resource consumption, etc. To this end, the management of *company G* defined a composite

indicator that measures water and energy consumption, carbon dioxide (CO_2) emissions and volatile organic compounds (VOCs) as well as the production and landfilling of waste. This indicator is regularly examined and frequently discussed at all levels in the organization.

3.2. Eco-Institutionals, or Using Interactive Environmental Management Control for Political Purposes

Eco-institutionals use interactive EMC to model the institutional environment according to their competitive strategy. They are looking to influence the legislative, regulatory and normative environmental frameworks governing their business sector, and align them with their own strategic objectives. Like the eco-designers, the eco-institutionals' interactive process takes on three forms (vertical, horizontal and external). However, the frequencies of interactivity, decision levels and stakeholders involved in the process differ in this new configuration (see Figure 3). In this study, *company I* (a specialist manufacturer of road-marking products) is the only example of the eco-institutional configuration.

Figure 3: Interactive Environmental Management as applied by Eco-Institutional



Analysis of Forms and Frequencies of Interactivity

In *company I*, the frequency of interactivity is variable (see Triangle 1 in Figure 3). Vertical interactivity is high since the control process is regularly monitored personally by top management (general manager, regional manager) and frequently discussed at different levels

in the organization (regional management, plant management, sales agency management, etc.). Monthly meetings are held by the management committee and regional committee. The environmental management review then takes place every half-year.

> *"We study the environmental dashboard through these ISO 14001 management reviews. (…) We also talk about the environment during our monthly meetings with the regions, and it's discussed at every management committee meeting. But we don't all cover it from the same perspective: the discussion is very technical during the management review and more qualitative in management committee meetings. There's one management committee meeting a month, and regional committee meetings as well. We discuss our environmental strategy at those meetings."* (General Manager, Company I)

Unlike eco-designers with their extensive green network, *company I's* network is limited to about ten environmental players. Formal discussions between them were rarely mentioned during the interviews. Interviewees emphasized their involvement in monthly or half-yearly meetings organized by regional and general management, although those meetings reflect vertical interactivity. In view of this, I consider that horizontal interactivity is fairly low in this company.

External interactivity, in contrast, has a very important role in the EMC process. It enables managers to set up permanent dialogue with their external stakeholders, to try and convince them of the need to change the road-marking products so they are more environmentally-friendly. These managers are especially involved in relations with three types of stakeholder: clients, public authorities and professional associations.

With its clients, *company I* capitalizes on its environmental performances in order to obtain competitive advantages (sales profits, cost optimization). It uses environmental conservation as a sales argument, seeking daily to persuade its clients to purchase eco-designed products (e.g., water-based paint) instead of competitors' products that are considered more harmful to the environment, as well as the health of workers and users. The environmental argument also is used to reduce freight costs.

> *"We have another indicator that involves grouping as many orders as possible into one truck bound for the same destination (...): that means we have fewer empty trucks, less pollution, less of whatever we want."* (Plant Manager, Company I)

With institutional players, *company I* uses external interactivity to try to influence their decisions upstream and act ahead of environmental regulations applicable to its sector of activity. It capitalizes on its eco-designed products to "*attract goodwill from public powers, who are always keen to highlight success stories"* (Gendron 2004), so that the authorities will oblige their competitors to engage in a similar environmental approach.

> *"We managed to change the frame of mind slightly. The specifications laid down in public procurement regulations didn't say much about environmental criteria. Everyone sort of did it their own way (focusing on thickness, weight, prices, duration, etc), but the environment was rarely mentioned. So our upstream work, our lobbying work, involved convincing political leaders of all stripes that price wasn't the only thing that mattered: protecting the planet was perhaps just as important as spending a little more or a little less money. (…) when the elected officials started to take a closer look at the environment, that kind of gave us top billing."* (Plant Manager, Company I)

This external interactivity is not restricted to relations with the public authorities; it also concerns various professional associations. *Company I* tries to influence the behaviour of other companies in its business sector by actively participating in working parties on best environmental practices, and the joint development of codes of conduct with professional organizations (e.g.: AFNOR: *Association Française de Normalisation*, the UIC: *Union des Industries Chimiques*) and environmental organizations (e.g.. OREE: *Organisation pour le Respect de l'Environnement dans l'Entreprise*). Given its excellent environmental performance, the company is seen as exemplary in its profession. It also worked with AFNOR on development of an environmental label for road-marking products. As well as reinforcing its social legitimacy, then, *company I's* environmental commitment also gives it a competitive edge, shaping the environmental standards of its profession according to its own strategic objectives.

> *"The company is extremely active in a professional federation; a few years ago, we were significantly involved in creating an "NF Environnement" label for road-marking products."* (General Manager, Company I)
>
> *"With "NF Environnement", clients who had left us a good while ago came back because of the environmental criterion; so you could say that was a successful move. (…) We can claim to have brought in the use of water-based paint on the road. At last we had an interesting product that differentiated us"* (Plant Manager, Company I)

Interpretation of Decision Levels

The interactive process at *company I* leads to strategic and tactical decisions (see Triangle 2 in Figure 3). Strategically, several radical green innovations (water-based paints, thermoplastic resins made from pine cellulose or crushed oyster shells, water-based road marker, etc) have resulted from discussions and sharing of ideas on products' environmental performance. As Gendron (2004) confirms, these innovations "*position the company in the public mind and give it credibility, goodwill and legitimacy"*. One example is the company's new road-marking product containing oyster shells instead of quarried limestone. This product was a success in terms of sales and media coverage, giving the company a sizable competitive advantage.

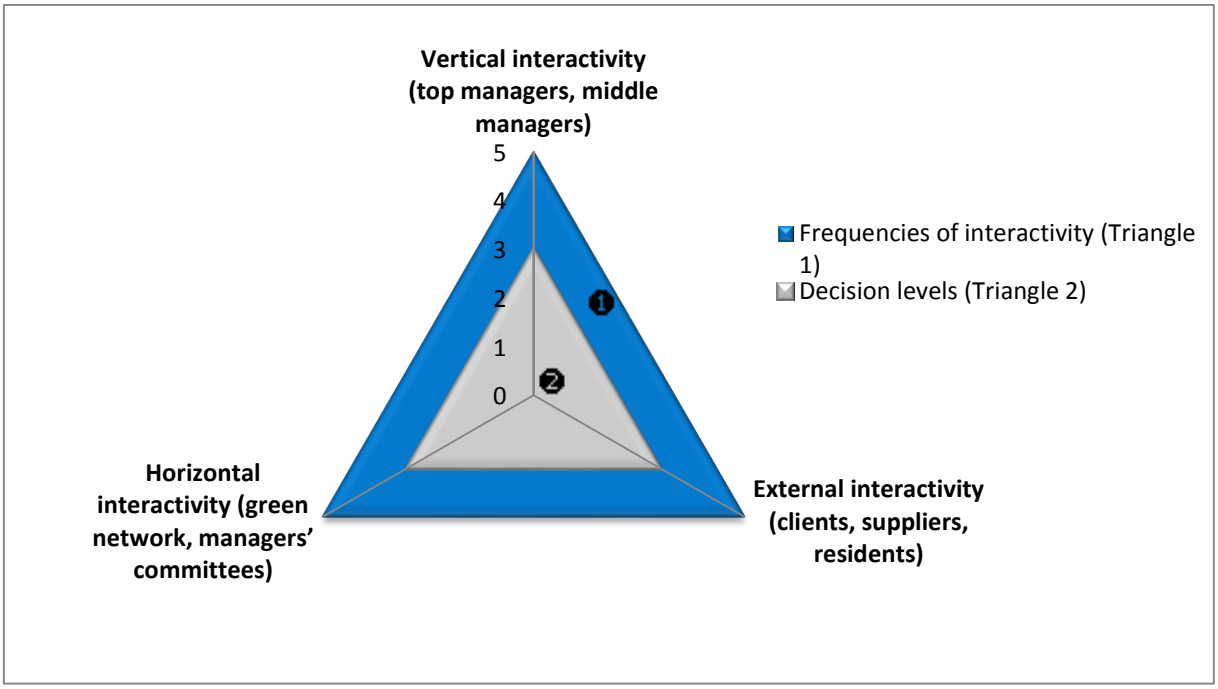
> *"So our technical manager ([our] evangelical environmentalist) claims that one day he went to get oysters for his wife at Christmas, and he met an oyster farmer from the Morbihan region [who] told him he had a whole load of oyster shells he didn't know what to do with. (...) And suddenly, he had an idea! (…) what are oyster shells made of? Limestone! And he asked him if he could grind the oyster shells fine enough to use in [our] marking products. [That's how], after two years of research, X was born, a thermoplastic road-marking product that's both green and efficient. As a result, our product appeared in all the newspapers, even Le Monde, "oysters on the road", TV commercials (…). You know what, we didn't spend a single cent to get this massive publicity campaign, which would have needed a few million euros investment; it was a great media coup"*. (Plant manager, Company I)

Tactically, the decisions relate to *ex-post* environmental management of production sites (energy management, management of waste and greenhouse gases, etc.). These decisions are made by operating managers at the local level (production sites) and consist of applying the company's green strategy to all levels of the organization.

3.3. Eco-Managers, or Using Interactive Environmental Management Control for Tactical Purposes

The eco-managers' green strategies are smaller-scale than those of the eco-designers and eco-institutionals. Eco-managers' interactive use of EMC fosters incremental innovations, which aim to improve the company's environmental performance, but do not involve any major changes to its business activities. *Companies A and J*, which fall into this category, belong to the airport and agro-food (wine and spirits) sectors.

Figure 4 : Interactive Environmental Management Control as applied by Eco-Managers



Analysis of Forms and Frequencies of Interactivity

Regardless of the form of interactivity, the frequency of formal discussions is high for eco-managers (see Triangle 1 in Figure 4). Vertical interactivity occurs regularly at different levels of the organization. At the level of top management, environmental data are discussed weekly or monthly by the management committee or executive committee. In the rest of the organization, middle managers (airport manager, vineyard and wine managers, etc.) are involved in the EMC process once a week or at least once a month to oversee their local performances. The same applies to their subordinates (production managers, sales managers, airport and terminal managers, etc.) who are in charge of environmental performance in their operating units. In *company J*, there is also a weekly management review specifically on environmental problems. In *company A*, this management review is held quarterly by each airport to discuss the operation and results of its environmental management system (EMS) and find ways to enhance its local environmental performance. Lastly, a general annual management review is carried out to report on environmental management for all airports.

Horizontal interactivity also shows high frequency in both companies. The green network meets every month to discuss environmental issues and share good practices on different sites. At *company A*, in addition to the green network, the managers' committee sometimes examines environmental data at its monthly meetings. This committee consists of the airport managers

and central business function managements (finance, safety, quality, communication, marketing, etc.).

Finally, external interactivity is seen in regular discussions with external stakeholders such as clients, suppliers and local residents. Through external interactivity, these companies strive to persuade their partners to follow their environmental approach, especially for economic reasons (competitive edge, reduced costs, enhanced supplier appeal). For example, *company A* set up a committee for information and discussion called the "*environmental partner club",* which promotes its environmental performance and relays good practices from different airport platforms. As well as protecting the environment, this club is a way for the company to optimize costs (by reducing water and energy wastage on its platforms, encouraging grouped purchases, etc.), but also to comply with its legal obligations (especially regarding the processing of aqueous emissions).

> *"We're the managers of storm water on our sites, [since] obviously, airplanes, cars, and all the industrial activities at airports potentially produce pollution. All storm water is collected and processed at treatment stations to make it more compatible with the environment before being discharged into the rivers. So we're spending a fair amount of money to provide this service, but we also bear significant responsibilities in this respect, since the management can be held criminally liable. As a result we're extremely attentive"* (Airport Manager, Company A).

In *company J*, the emphasis is on supplier relations. Environmental protection is an argument for attracting vineyard owners in the local region, where the company purchases 80% of its grapes.

> *"Setting an example also increases our company's appeal. It means being aware that we'll be able to attract more vine growers to sell us grapes [by telling them] that it's better for them to sell their grapes to a company that protects the environment, has good brand image and quality, and is a leader in environmental practices"* (EQ Director, Company J).

As regards local residents, external interactivity is used to convey a positive image as responsible companies, to maintain the corporate reputation and consolidate social legitimacy. *Company A,* for example, has set up a contact space called the "environment house" at each of its airports to inform the public of its environmental performances (particularly reducing noise and air pollution). At the head office, it has set up a special department to handle relations with local residents. It regularly authorizes the general public to visit its airport platforms. It has put

together a panel of stakeholders (including local residents) to carry out an annual evaluation of its sustainable development report.

> *"Regarding local community relations, we have a lot of contact on the impact of our work through the local residents' information area set up on the platform, where anyone interested can find out about how the airport is run, the impact of our activities in terms of noise, etc."* (IMS Manager, Company A).

Interpretation of Decision Levels

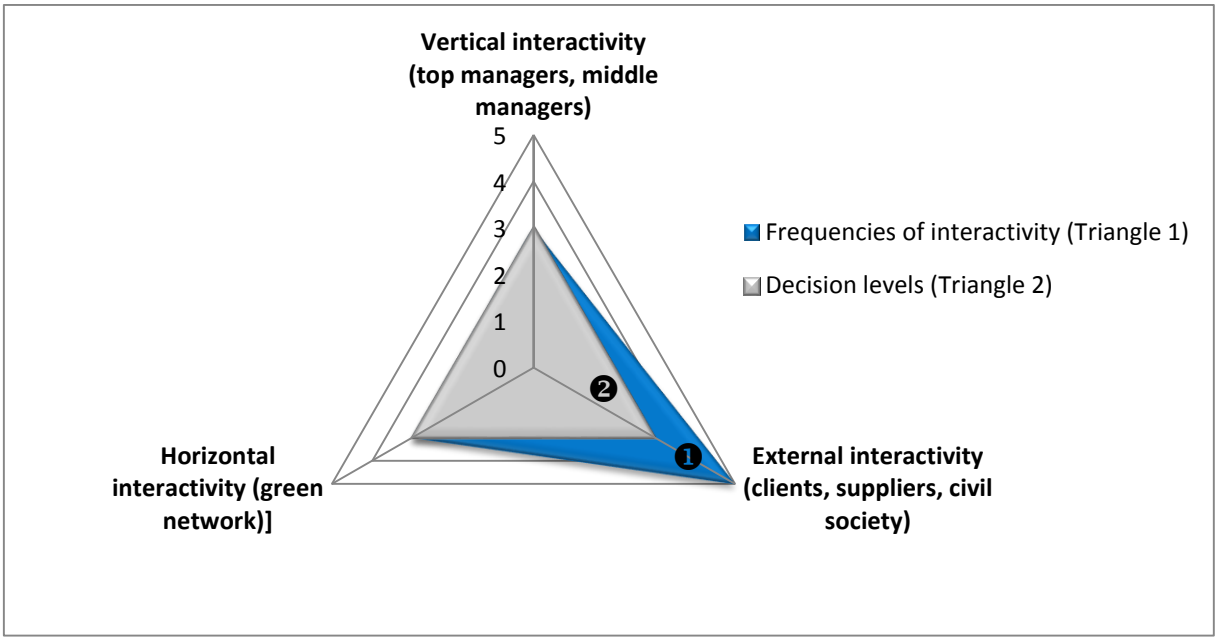
As implemented by eco-managers, the interactive process stimulates incremental green innovations to improve the environmental performance of our operating sites. This process leads top and middle managers to make tactical decisions (see Triangle 2 in Figure 4), which are part of an eco-efficiency strategy.

> *"We have an environmental policy that focuses on energy management, water treatment, water consumption, noise management and waste management (…): we've carried out many actions to improve the efficiency of energy production and distribution (...); concerning water, our airports have long been equipped with storm water treatment plants (...) and we re-use this water for cooling the refrigeration units (...); regarding airport noise, which is a long-standing problem, the intensity is falling (...); regarding waste, we're working hard on improving sorting for recycling, minimizing landfill waste, reducing the transport mileage to take our waste to different sites"* (Airport Director, Company A).

3.4. Eco-Educators, or Using Interactive Environmental Management Control from an Educational Perspective

For eco-educators, the company's environmental responsibility is not limited to its economic stakeholders, but extends to all civil society. In this configuration, interactive EMC is used to meet a dual objective: an economic objective that is part of an eco-efficiency strategy, and an educational objective aiming to educate civil society and raise awareness of environmental (and sometimes sustainable development) issues. *Companies B and H*, which belong respectively to the retail and eco-industry sectors, illustrate this configuration.

Figure 5: Interactive Environmental Management Control as applied by Eco-Educators



Analysis of Forms and Frequency of Interactivity

For eco-educators, interactivity is primarily outward-looking. Although the different players (top managers, middle managers, green networks) are involved in the environmental management of their companies, the frequency of discussions is relatively average internally (from every two months to half-yearly, or even annually), while permanent dialogue has been established with external stakeholders (see Triangle 1 in Figure 5). These companies focus their attention on external stakeholders since better corporate environmental performance depends on improvements by those partners:

> *"For the carbon footprint, companies generally make good progress over the first three to five years. After that, improving results is far more complicated for us. In such cases, the solution is to help our suppliers and partners to make headway; by getting them to make progress, they improve the company's carbon footprint."* (General Manager, Company B)

In terms of external interactivity, suppliers and clients are the economic stakeholders most frequently involved in the EMC process. For example, in order to improve environmental performance, *company B* set up a green purchasing policy in partnership with its suppliers, which consists of reducing product packaging, using biodegradable materials in packaging, auditing their production sites, especially in Asia, to ensure that environmental commitments have been respected, and so on. This company also encourages its clients to make grouped orders or have products bought on the Internet delivered to stores. All these actions have a dual

environmental and economic benefit: they reduce greenhouse gas emissions from transportation, and therefore cut transportation costs at the same time.

> *"Whenever [clients] order on the Internet, we're the only ones dealing with transportation. So we tried to see what was done externally, and we saw that some used (...) pick-up points. Then we quickly realized that our 70 stores throughout France, that actually makes 70 pick-up points. [Which] means we can deliver to the client free of charge, so that's better for him, and the carbon impact is almost nil since it's delivered to him in our [stores]."* (General Manager, Company B)

Beyond the economic issues, these companies have a clearly militant stance: ever since they were formed they have been involved in an educational campaign to raise awareness of environmental issues in civil society. They regularly organize talks, debates and educational activities for the general public. For example, *company H* supports local communities and schools in domestic composting practices. *Company B* has set up an annual educational day to encourage debates between experts and civil society. It also funds several projects through its foundation for the protection of nature.

> *"[X] combined district council asked us if we could go into schools to tell children about composting. The children were very receptive and had great fun looking for the small bugs that set off waste breakdown, and drawing them…"* (Management Report, Company H)

> *"The chain acts directly, raising public awareness through big and small events, but also indirectly, via its Foundation and the financial support it provides to actors operating at the grassroots level. (…) To keep people informed and aware of major issues, [the company] holds a large number of meetings between the general public and experts so that everyone can participate in the debates of concern to society (…) during a [X conference], six debates on the future of energy were attended by experts from the worlds of ecology, economics and politics"* (Sustainable Development Report, Company B).

Interpretation of Decision Levels

For eco-educators, the interactive process leads to tactical decisions (see Triangle 2 in Figure 5) such as responsible purchasing policies, waste management, transportation management, environmental communication, etc. However, no strategic decision, in the sense of radical innovation, emerges from the internal practices of these companies.

> *"We did a railroad experiment at the end of last year, which saved us 25 tonnes of CO_2/1000 tonnes. We know that if we extend this experiment to ten stores that get their deliveries that way (by rail), we should be able to cut CO_2 emissions on transportation of goods by more than 30%*

(a equivalent to 300 tonnes or 1/3 of our emissions). Transporting goods is where we have the greatest impact on the environment" (SD Manager, Company B).

3.5. Summary of Configurations

As seen above, this research focuses on four typical configurations for interactive EMC: eco-designers, eco-institutionals, eco-managers and eco-educators. These configurations differ in three areas: forms of interactivity (vertical, horizontal, external), frequencies of interactivity (high, medium, low), and decision levels (strategic, tactical, operational). Each configuration emphasizes one major role for interactive EMC in companies. This control is a managerial process used for strategic, political, tactical or educational purposes (see Table 2).

These four configurations can be classified along a continuum going from eco-managers to eco-educators, then to eco-designers and eco-institutionals. The former pair involve external stakeholders (clients, suppliers, residents) for economic and image reasons, while the latter pair reach beyond economic considerations and try to mobilize civil society on environmental challenges. Eco-designers are eco-managers who have adopted an eco-design strategy and use interactive EMC to stimulate radical green innovations. Eco-institutionals are eco-designers or eco-managers who seek to influence public authorities and professional associations to bring legislative, regulatory and normative frameworks into line with their strategic objectives. By focusing on these configurations, this research shows the complexity and diversity of uses made of interactive control in the environmental field.

Table 2: Summary of Four Typical Configurations of Interactive Environmental Management Control

Configurations	Forms of Interactivity	Frequencies of Interactivity	Decision Levels	Dominant Role of Control
Eco-designers (companies C, D, E, F and G)	Vertical (discussions between top managers, middle managers, and their subordinates at all levels of responsibility)	High	Strategic (radical green innovations)	Use of interactive EMC with a strategic purpose (to stimulate green innovations, and achieve a competitive edge and legitimacy)
	Horizontal (discussions in the Green Network or Managers' Committee)	Medium	Tactical (incremental green innovations)	
	External (discussions with clients, suppliers, local residents)	High		

Eco-institutionals (Company I)	Vertical (discussions between top managers, middle managers and their subordinates at all levels of responsibility)	High	Strategic (radical green innovations) Tactical (incremental green innovations)	Use of interactive EMC for political purposes (to modify legislative, regulatory and normative frameworks in line with the company's strategic objectives)
	Horizontal (discussions in the Green Network)	Low		
	External (discussions with clients, public authorities, professional associations)	High		
Eco-managers (companies A and J)	Vertical (discussions between top managers, middle managers and their subordinates at all levels of responsibility)	High	Tactical (incremental green innovations)	Use of interactive EMC with a tactical purpose (to improve environmental performances gradually, to optimize costs, to comply with legislation, to preserve the company's reputation)
	Horizontal (discussions in the Green Network or Managers' Committee)	High		
	External (discussions with clients, suppliers, local residents)	High		
Eco-educators (companies B and H)	Vertical (discussions between top managers, middle managers and their subordinates at all levels of responsibility)	Medium	Tactical (incremental green innovations)	Use of interactive EMC with an educational objective (to raise awareness and educate civil society about environmental challenges). This does not mean that the economic objective is excluded.
	Horizontal (discussions within the Green Network)	Medium		
	External (discussions with clients, suppliers, civil society)	High		

Discussion and Conclusion

The objective of this research is to study interactive control in the environmental field. The results bring out four typical configurations of interactive EMC (eco-designers, eco-institutionals, eco-managers and eco-educators), but also provide theoretical, managerial and methodological lessons and open up new research avenues.

In theoretical terms, this research encourages us to rethink the interactive design of management control. Firstly, it offers a new perspective by revealing a third form of interactivity—external interactivity—which emphasizes the involvement of external stakeholders (clients, suppliers, local residents, public authorities, etc.) in the interactive control process. These results expand

on and complement previous work, since the concept of interactivity in the literature appears restrictive, being limited to its internal dimensions: vertical (Simons 1995) and horizontal (Tani 1995, Gautier 2002, Berland and Persiaux 2008). In other words, researchers have only focused on the involvement of top or middle managers in the interactive process. Yet the distinctive elements of interactive control—debate and dialogue—are also found in companies' relations with their external stakeholders, enabling them to adapt their strategy to the demands of these stakeholders. Moreover, in CSR, "*the demands of [external] stakeholders serve as a basis for the assessment criteria for CSR performance"* (Capron and Quairel 2007, p. 38). It would thus appear difficult to disregard them without calling into question companies' economic and financial performance, maybe even their long-term survival. Ultimately, this study contributes to a renewal of interactive approaches to management control by opening up the borders of this discipline to recent work on stakeholder theory (Andriof and Waddock 2002, Greenwood 2007, Sobczak and Berthoin Antal 2010, and others). Future research could explore stakeholder involvement further, and show in which contexts external interactivity is more effective than other forms of interactivity for managerial decision-making.

Secondly, this study questions Simons' assertion that interactive control is used for strategic decision-making. Our results show that the interactive use of EMC may lead managers to make tactical-level decisions (e.g., companies in the eco-managers and eco-educators categories). This shows that interactive control does not systematically lead to major strategic changes: incremental or minor innovations can also come out of this process, providing companies with gradual improvements. On the other hand, this study does not indicate top management involvement in operational decision-making (by non-managers). In this case, interactive control seems to be limited to strategic and tactical decisions.

At the managerial level, this research shows managers the importance of EMC and its interactive use in decision-making and the attainment of corporate goals. Through the typical configurations identified, this study shows the different objectives of interactive EMC: strategic, political, tactical and educational. The study also underlines EMC's role as a channel for dialogue with stakeholders. Moreover, the analysis model developed in this research may be used as a map of the interactive control process in companies. This model should give managers a representation of the different internal and external stakeholders in their decision-making process, modes and frequencies of dialogue with them, and their role in this

process. This map must not be considered statically, but rather from a perspective of dynamic forward planning and "proactive management control" (Bouquin 2009).

However, these contributions must also be assessed in the light of the theoretical and methodological limitations of this research. The theoretical limitations are inherent to the configurational approach (Miller and Friesen 1984) within which the research falls. As with most studies taking this approach, questions arise on the connections between the configurations over time (moving from one configuration to another) and the potential existence of hybrid configurations. The methodological limitations relate to the "qualitative" nature of the research. However, the customary precautions were taken to ensure internal and external theoretical validity in the research (see Hlady Rispal 2002, Miles and Huberman 2003, Yin 2003, Bardin 2007). The main precautions were using different sources from the literature when defining concepts, triangulating data sources (primary and secondary), methods of data collection (interviews, document analysis, observation) and data analysis (vertical, horizontal), and comparison by replication (the ten cases studied, representing diverse organizational contexts, were selected based on the theoretical concepts used in the research following a replication process).

As a research perspective, it would be interesting to analyze the interactive use of EMC based on the joint perceptions of managers and external stakeholders. A study based on both these points of view would enhance understanding of the role of EMC as an answer to environmental issues. This is important, since we know that the stakeholders' demands in this area are often conflicting.

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Appendix: Data Collection for Case Studies

Sector of Activity	Company	Size	Interviews Conducted (Primary Data)	Documents Collected (Secondary Data)
Aeronautics	A	7955	⇨ Environmental Manager ⇨ IMS Manager ⇨ Airport Manager	⇨ Environmental policy ⇨ Sustainable development reports ⇨ Annual reports ⇨ Institutional press releases ⇨ Institutional Web pages ⇨ Press articles ⇨ ISO 14001 certificates ⇨ Environmental aspects and impacts ⇨ Green dashboards ⇨ Management review report ⇨ Statuses ⇨ Organizational charts ⇨ Etc.
Trade and Distribution	B	853	⇨ SD Manager ⇨ Store Manager ⇨ General Manager	
Chemicals and Plastics	C	600	⇨ QHSE Manager ⇨ Institution Manager	
	D	5000	⇨ NEC ⇨ Site Manager ⇨ General Manager	
Industrial Gases	E	800	⇨ QE-MR Manager ⇨ HSE-MR Manager ⇨ Site Manager ⇨ Regional Manager	
	F	1900	⇨ QSE Expert ⇨ SQHE Manager	
Plastics and Rubber Industry	G	30000	⇨ EH Manager ⇨ Risk Manager ⇨ Plant Manager	
Eco-Industry	H	24	⇨ SME Instructor ⇨ Manager	
Road Marking	I	350	⇨ Technical and Purchases Manager, Sustainable Development Manager ⇨ Plant Manager ⇨ Agency Manager ⇨ Regional Manager ⇨ General Manager	
Agro-Food	J	500	⇨ QE Manager (2 interviews) ⇨ Vineyards and Wine Manager ⇨ CEO	

⇨ **Abbreviations:**
Q: quality, H: hygiene, S: safety, E: environment
IMS: Integrated Management System
SD: Sustainable Development
NEC: National Environmental Coordinator
CEO: Chief Executive Officer

Notes

[i] In addition to interactive control and diagnostic systems, Simon's conceptual framework includes two other checks and balances: belief systems, which define the values of the company and encourage players to meet organizational goals, and constraint-based systems that limit the opportunism of managers and set ethical rules. Unlike value-constraint systems, the first two checks and balances more specifically correspond to management control. I therefore focused on these checks and balances, particularly interactive control, which is still unclear in the literature.

[ii] Just like Carroll and Näsi (1997), I differentiate between internal stakeholders (owners, top managers, middle managers, non-managers) and external stakeholders (clients, suppliers, competitors, public authorities, environmental associations, residents, financial community, media, etc.).

[iii] Excel formula =COMBIN(9;3)=84.

[iv]Like most qualitative research, this study takes a limited number of cases in their context in order to explore them in more depth. The goal is not statistical generalization, but rather analytical generalization based on the theoretical criteria mentioned in this article. Moreover, the qualitative research examples provided by Yin (1990) in cases of theoretical saturation do not exceed twelve cases (Hlady Rispal 2002).

[v] According to Gendron (2004), companies that are proactive environmentally adopt two types of green strategies: either they look to achieve higher-than-average environmental performance to gain competitive advantage while continuing to pursue traditional economic and financial goals (leadership strategy), or they go further by putting environmental challenges and sustainable development issues (environmental strategy) at the heart of their very existence and purpose.

[vi] Given the size of the matrices, it is not possible to present them here. However, the transcripts taken from these matrices are quoted in the article.

[vii] This presentation was inspired by Lambert and Sponem (2009).

[viii] To respect the anonymity of companies and the people we met, we removed from the transcripts anything that could identify them without actually altering the statements made.

[ix] The issue of stakeholder representativeness and legitimacy has been debated in the literature (see Capron and Quairel 2007). For example, for Mitchell et *al*. (1997), managers choose and rank players who will be part of their strategy based on three factors: the ability to influence organizational decisions, the level of legitimacy of relationships with companies and the urgency of the need.

[x] SEVESO: European Directive for the Prevention of Major Industrial Risks.